

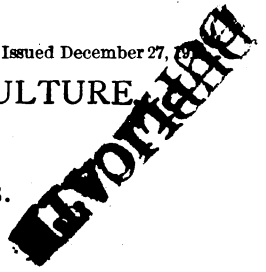
Historic, archived document

Do not assume content reflects current scientific knowledge, policies, or practices.

Issued December 27, 1912

U. S. DEPARTMENT OF AGRICULTURE

FARMERS' BULLETIN 518.



WINTER BARLEY.

BY

H. B. DERR,

*Agronomist, Formerly in Charge of Barley Investigations, Office of Cereal
Investigations, Bureau of Plant Industry.*



WASHINGTON:
GOVERNMENT PRINTING OFFICE.

1912.

LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF PLANT INDUSTRY,
OFFICE OF THE CHIEF,
Washington, D. C., September 27, 1912.

SIR: I have the honor to transmit and to recommend for publication as a Farmers' Bulletin the accompanying manuscript, entitled "Winter Barley," prepared by Mr. H. B. Derr, Agronomist, formerly in charge of barley investigations, under the direction of Mr. Carleton R. Ball, Acting Cerealist in Charge of Cereal Investigations.

Owing to the many uses to which winter barley is adapted, the crop is rapidly coming into favor in many localities south of the Ohio and Platte Rivers and also in the States west of the Rocky Mountains. It is unquestionably the best nurse crop for grasses and clover, makes excellent hay, and is a splendid pasture and cover crop. In this bulletin the most suitable soils and their preparation, selecting and sowing the seed, and the care of the crop are described. It is believed this information will aid in making the growing of winter barley more certain and profitable. Much of the matter presented is the result of original investigation, but reports received from experiment stations and from correspondents have also been drawn upon.

Respectfully,

B. T. GALLOWAY,
Chief of Bureau.

Hon. JAMES WILSON,
Secretary of Agriculture.

CONTENTS.

	Page.
Introduction.....	5
Varieties of winter barley.....	5
Areas of culture.....	7
Soils adapted to the crop.....	7
Fertilizers and manures.....	8
Commercial fertilizers.....	8
Barnyard manure.....	8
Green manures.....	8
Rotations with reference to barley.....	9
Place in the rotation.....	9
Rotations adapted to various States.....	9
Preparation of the seed bed.....	11
Preparation of the seed.....	12
Fanning and grading.....	12
Testing for germination.....	12
Sowing the seed.....	12
Date of seeding.....	12
Rate of seeding.....	13
Method of seeding.....	13
Cultivation.....	14
Harvesting the crop.....	14
Cutting.....	14
Shocking and stacking.....	15
Thrashing.....	15
Storing the grain.....	15
Uses of winter barley.....	15
Grain for stock feed.....	15
Pasture.....	16
Soiling crop.....	16
Hay crop.....	16
Nurse crop.....	16
Cover crop.....	17
Improvement of the crop.....	17

ILLUSTRATIONS.

	Page.
FIG. 1. Heads of Tennessee Winter barley; also detached kernels with the awns removed-----	6
2. A field of Tennessee Winter barley in Anne Arundel County, Md., 1909, seeded after corn-----	10
3. Plats of winter barley at the Arlington Experimental Farm, Virginia, showing severe winterkilling of the broadcast plat in contrast to the drilled plat-----	14
4. A field showing winter barley as a nurse crop for red clover at the Tennessee Agricultural Experiment Station, Knoxville-----	17

WINTER BARLEY.

INTRODUCTION.

Winter barley is rapidly growing in favor as a farm crop. Its popularity is largely due to the fact that it yields better than spring barley, without an increase in the cost of production. It is also more certain to produce a crop than spring-grown grain, especially in hot, dry seasons. The early colonists of Virginia and the Carolinas grew winter barley quite extensively, but corn, cotton, and tobacco proved to be more profitable for a time; hence, there was a decline in its production. In recent years, since the necessity for diversification has been recognized, there has been a revival of interest in this crop.

VARIETIES OF WINTER BARLEY.

The most popular variety of winter barley is the Tennessee Winter, the heads and grains of which are shown in figure 1. This is a six-rowed bearded variety, with yellowish white beards and heads, which has been grown in the Atlantic Coast States since the early colonists introduced it. No effort was made to improve it until in 1900, when the Tennessee Agricultural Experiment Station began breeding it and gave it the name "Tennessee Winter."

Union Winter barley closely resembles the Tennessee Winter. It was obtained from Canada in 1900 by the Tennessee station, which has grown and improved it since that time. The Maryland Winter and Texas Winter varieties have been grown locally for many years in the States whose names they bear. They are very similar in appearance to the Tennessee Winter. Wisconsin Winter, a variety with slightly shorter, broader heads than Tennessee Winter, has also been grown in Texas and Maryland.

A number of other varieties of winter barley have been introduced from abroad by the Department of Agriculture, and are now being tested at several of its experiment farms.

The Office of Cereal Investigations has succeeded in changing 16 spring barleys into winter forms by the selection of the hardiest plants. These 16, in addition to the 29 varieties of winter barleys

now on trial, make a total of 45 varieties and strains of barley which are being tested from fall seeding.



FIG. 1.—Heads of Tennessee Winter barley, side and front views; also detached kernels with the awns removed. Maryland Winter, Union Winter, and Texas Winter barley are similar forms. In Wisconsin Winter barley the heads are not quite so long and are somewhat broader.

These 45 varieties may be divided into three groups, according to the form of the heads. These are the square six-rowed, the round

six-rowed, and the flat or two-rowed groups. The Tennessee Winter is typical of the first group, the Utah Winter of the second, and the Chevalier and the Hannchen of the third. The varieties of the third group are ordinarily sown in the spring, but have been grown with success from fall seeding on the Arlington Experimental Farm, near Washington, D. C.

AREAS OF CULTURE.

Winter barley culture is at present confined to the States south of the Ohio and Platte Rivers and those west of the Rocky Mountains, the crop being most largely grown in the area first mentioned. The acreage is rapidly increasing and there is no question that in the near future winter barley will be one of the important winter cereals. It is probable that through further selection the area can be extended on certain types of soil as far north as the southern boundaries of Wisconsin and South Dakota.

In some of the States both spring and winter barley can be grown, while in others the cultivation of only one of these divisions is practicable. The States in which only winter barley is profitable are Maryland, Virginia, North Carolina, South Carolina, Georgia, Alabama, Kentucky, Tennessee, and Texas. In Kansas, Oklahoma, New Mexico, Arizona, Utah, Nevada, California, Oregon, and Washington both winter and spring varieties are grown, but winter barley is generally superior to spring barley in both yield and quality. Experimental plantings of winter barley have been made in a number of other States, though spring barley is much more generally successful outside the States already mentioned.

For the eastern, central, and southern portions of the United States, Tennessee Winter barley and its allied forms give the best results. West of the Rocky Mountains, the White Winter and the Utah Winter, both round six-rowed varieties, generally do best.

SOILS ADAPTED TO THE CROP.

Winter barley requires a more fertile soil than wheat and does best on one containing considerable humus, although an excess of nitrogenous fertilizers or manure will cause lodging. However, even if barley does lodge, the grain fills fairly well and the loss is less serious than with oats or wheat. The best soils for barley are the well-drained black prairie and alluvial loams and the volcanic soils, especially if they are in good physical condition. Good yields of winter barley may be produced under favorable conditions on sandy loams which contain considerable humus, but the crop is much more susceptible to injury during dry seasons than when grown on heavier soils. Undrained clay soils are also unsuited to successful winter barley culture. While there may be little difficulty in obtaining a

good stand in the fall on soils of this character, the freezing and thawing of the winter and early spring are likely to expose the roots of the young plants and cause injury. Well-drained and well-fertilized gravelly-clay soils sometimes give good results. Loose, sandy soils are unsuitable because of their inability to retain sufficient moisture for good germination in the fall or to carry the crop over a prolonged dry period. In the Great Plains area there is considerable crop loss at times from the drifting of soils of this type.

FERTILIZERS AND MANURES.

Winter barley is a shallow feeder, for field observations show that the principal feeding roots are confined to the upper 6 inches of soil. For this reason the crop readily responds to the use of commercial fertilizers or manures in an available form.

COMMERCIAL FERTILIZERS.

In many localities in the Southern States it is believed that the best results will be obtained if commercial fertilizers are used. This need of commercial fertilizers is principally due to the fact that the green crops are generally removed for hay, and the stubble that is plowed under adds little to the productiveness of the soil.

Where the soil is deficient in humus and plant food a complete fertilizer should be used. The best results are sometimes obtained if only part of the fertilizer is applied at the time of seeding in the fall and the remainder is added the following spring, this latter application giving the crop a vigorous start. A fertilizer that has given excellent satisfaction in the Southern States consists of the following: Acid phosphate, 1,400 pounds; tankage, 200 pounds; muriate of potash, 200 pounds; nitrate of soda, 100 pounds; and dried blood, 100 pounds. This mixture is well balanced, as it contains plant food which becomes available throughout the growing period of the plant. It should be applied at the rate of 200 to 300 pounds per acre.

BARNYARD MANURE.

Barnyard manure is unquestionably the best kind of fertilizer if used at the proper time. For the best results it should be applied to the crop which precedes barley. The plowing under of a heavy application of manure just previous to sowing winter barley often causes the failure of the crop. The soil is made open and porous by the bulky material and is easily influenced by climatic changes, so that in dry seasons failures or greatly reduced yields are certain to follow.

GREEN MANURES.

Green manures, such as cowpeas, soy beans, rye, vetch, or clover, will give excellent results, but they must be plowed under some time

previous to planting winter barley in order to allow at least partial decomposition of the green material and the settling of the soil. The green manure in its decay very often furnishes sufficient moisture to the soil to start germination and to give the young plants a vigorous start, even though the soil is dry. Where a green-manure crop is plowed under, little or no commercial fertilizer is required.

Clay soils, especially those on which a green-manure crop has been plowed under, are likely to be acid. This condition can be corrected by the addition of 20 to 25 bushels of burnt lime or of 1,000 to 2,000 pounds of finely crushed limestone to the acre.

ROTATIONS WITH REFERENCE TO BARLEY.

PLACE IN THE ROTATION.

Winter barley can well be included in many rotations and readily lends itself to such use. As it may be removed from the land early it allows cultivation of the soil to conserve moisture and also to keep down the weeds. It also advances the harvesting season, being out of the way before wheat harvest begins. Winter barley can be used in place of winter wheat or oats, as it requires no more labor in soil preparation or harvesting. The returns will prove profitable if the crop is properly handled. Where trouble is experienced with weeds, a rotation which includes corn followed by winter barley is recommended as an efficient remedy.

ROTATIONS ADAPTED TO VARIOUS STATES.

Suggestions as to rotations in States where winter barley can be grown and as to the places that the crop may occupy in such rotations follow.

Maryland.—The best results in Maryland are obtained when barley follows a cultivated crop, such as potatoes. It sometimes follows corn, but this is not advisable, as it makes the seeding too late. Barley should be sown in Maryland during the first two weeks in September. Where it follows a leguminous crop the legume should be plowed under or removed and the land prepared several weeks before planting to allow the settling of the soil. Figure 2 shows an excellent crop of winter barley in Anne Arundel County, Md., which was sown after corn had been cut for fodder.

Virginia.—Barley is sometimes seeded after wheat in the eastern portion of the Piedmont area of Virginia, and after corn in the western part, but the best results are obtained when winter barley is sown after cowpeas or soy beans. The writer obtained an excellent crop of barley from a small field upon which a crop of spring oats had been grown for hay. An early variety of cowpeas was sown after the oats were removed, and the crop was turned under as green

manure about September 1. The ground was packed by harrowing and disking, and the barley was sown two weeks later.

The following rotation has been recommended by the Virginia station as adapted to the Piedmont region of the State: First year, corn, with 15 pounds of crimson clover to the acre seeded at the last cultivation to remain as a cover crop; second year, crimson clover plowed under about the middle of May and the field planted to cowpeas, the peas to be cut for hay and the land plowed for winter wheat; third year, wheat. Immediately after the wheat is harvested the stubble is disked or plowed and a fine seed bed prepared. About August 15 a mixture of 10 pounds of timothy, 12 pounds of mam-



FIG. 2.—A field of Tennessee Winter barley in Anne Arundel County, Md., 1909, seeded after corn.

moth clover, and 4 pounds of redtop is sown. Hay is produced the fourth and fifth years. As winter barley can be successfully grown in the Piedmont region, it could well replace wheat in this rotation.

North Carolina and South Carolina.—The best results are generally obtained in the Carolinas if barley is sown in October, following a leguminous crop, corn or potatoes being the next choice.

Tennessee and Kentucky.—A number of distinct soil types are adapted to barley growing, but probably the best soils are the red-clay lands of east Tennessee and the phosphate lands of middle Tennessee. A rotation which includes barley as the grain crop has been recommended by Dr. H. A. Morgan, director of the Tennessee experiment station, as follows: Sod land should be plowed in the

fall and planted to corn the following spring, the corn to be followed by a green-manure crop, such as crimson clover; soy beans planted in rows should follow, the crop being taken off for hay or seed. The land should then be thoroughly disked and harrowed and seeded to barley. After the barley is removed, unless clover was sown with it, the land should be summer plowed and put in good preparation for clover and grasses, to be sown the latter part of August.

Georgia.—A crop rotation recommended for Georgia is as follows: First year, cotton, seeded to bur clover or vetch at the last cultivation; second year, this cover crop is plowed under for corn and the corn followed by winter oats; third year, the oats are followed by cowpeas cut for hay and the land then prepared and sown to hairy vetch. In this rotation winter barley may be sown in the cotton or it may replace the oats.

Alabama.—Rotations which include grain crops are not generally used in Alabama. A rotation suggested by the experiment station of that State is as follows: First year, corn, with cowpeas between the rows; second year, small grain, usually oats, with cowpeas; third year, cotton; fourth year, cotton or corn, as before. Barley might enter this rotation, taking the place of the oats. Barley sown in the fall, after the cowpeas are removed, serves as a winter cover crop and as a nurse crop for grass or clover sown in the spring.

PREPARATION OF THE SEED BED.

The most essential features in the preparation of soils for winter barley are that they be fairly dry and free from weeds and worked into a seed bed which is loose to a depth of 4 or 5 inches, but which is firm beneath. Much of the success depends upon the condition of the seed bed.

Various methods of preparation are followed. A popular one is to manure the land in the fall, plow deep, and leave the land rough. In the spring the land is disked and harrowed thoroughly and then planted to corn. In the fall the corn is cut and removed or placed in large shocks in straight rows, and the ground is double-disked both ways and harrowed. This method has much to commend it, for it gives a loose surface and a firm soil below. Where barley follows winter wheat or oats, the field may be plowed or heavily disked and harrowed as soon as these crops are removed. A fine, mellow seed bed, free from weeds, is formed by continuing the cultivation throughout the summer. The mulch thus formed retains the moisture in the soil and also prepares it to receive the fall rains. A shallow disk and a cross-harrowing before planting insure a perfect seed bed.

Where winter barley follows other than a cultivated crop, better results usually are obtained if the soil is plowed or disked and harrowed at least four to eight weeks prior to seeding. This allows the

settling of the soil and also improves its water-holding capacity. Many failures have resulted from planting on newly plowed ground, especially where a dry season followed. Winter barley seldom does well on newly broken sod. Breaking should be done while the vegetation is green, as this greatly facilitates decomposition. Sod land which is broken late, when the plants and roots are tough, is not suitable for this crop, as the soil is too open and the decay is too slow.

PREPARATION OF THE SEED.

Winter barley for seeding should be carefully selected. If small and imperfect seed is used, the yield will be considerably reduced because of the inferior plants produced. Frequently these plants fail to survive the winter, thus reducing the stand of grain.

FANNING AND GRADING.

By means of the fanning mill or screens the undesirable kernels can be eliminated and the percentage of stand and winter survival considerably increased. If no fanning mill is available, the seed can be successfully graded by the use of the specific-gravity method,¹ which consists in immersing the seed in a tub of water and thoroughly stirring it. The light, chaffy, and diseased kernels will float on the surface and can be skimmed off. The plump kernels which sink to the bottom are the only ones that should be used for seed.

TESTING FOR GERMINATION.

If at all doubtful regarding the germination of the barley seed, it is well to test several lots of 100 kernels each in plates of sand or earth or between pieces of moist blotting paper or canton flannel. It is necessary for the best results to keep the material moist and at a temperature of about 70° F. If less than 90 grains germinate, the quantity sown to the acre should be increased accordingly.

SOWING THE SEED.

Without doubt a considerable proportion of the failures in the cultivation of winter barley are due to improper methods of seeding. The most important factors are the date, the rate, and the method of seeding, all of which are under the control of the farmer, and, consequently, the improper methods should be easily rectified. The factors noted will be considered in detail.

DATE OF SEEDING.

The date of seeding winter barley varies with the locality and the season. If unfavorable weather follows, a difference of two or three weeks in the time of seeding may mean the partial or the entire loss of the crop. The largest yields reported to the Department of Agri-

¹ Derr, H. B. The Separation of Seed Barley by the Specific-Gravity Method. Circular 62, Bureau of Plant Industry, U. S. Dept. of Agriculture, 1910.

culture were from sowings made from September 15 to October 5. In Maryland the best results are obtained from seeding during September; sowing before September 15 is advisable in the western portion of the State. The latter half of September is the best time to sow winter barley in the Piedmont region of western Virginia and North Carolina and eastern Tennessee. At lower elevations in these States and in the South generally the seed may be sown from September 20 to October 15, or even at a later date where the winters are not severe. In Kansas the best date for seeding is usually between September 20 and October 1. A difference of several weeks in the date of seeding makes little difference in the time of ripening, but late seedings usually winterkill badly, and the yield is thus reduced. The date of seeding in Utah, Idaho, California, and other far Western States depends so largely on local conditions that no definite date can be given, but barley should be sown earlier than wheat in all cases.

RATE OF SEEDING.

The quantity of seed to sow to the acre varies with the locality and the conditions that prevail. In the semiarid regions of the West and Southwest from 4 to 6 pecks of winter barley are sufficient, but where the rainfall is ample 2 bushels have generally given the best results. Sowing more than 2 bushels to the acre is not to be recommended. The proper quantity to sow should be governed by the supply of moisture and plant food available in the soil. Where the germination is low, the rate of seeding should be increased accordingly.

METHOD OF SEEDING.

The best method for seeding winter barley is with the grain drill. This insures a more uniform distribution and better germination of the seed, two of the most important factors in obtaining a perfect stand.

Grain sown in drills can withstand a dry autumn better than that sown broadcast. The young plants also develop a deeper root system, thus avoiding much of the danger from heaving during the alternate freezing and thawing periods of the winter and early spring. When winter barley is sown broadcast and harrowed in, the grain is covered to various depths, and careful observation has shown that while a perfect stand may be obtained in the fall, few fields have been entirely able to withstand a severe winter. The young plants on the surface invariably fail to survive either a long dry period following the sowing or severe cold weather. Figure 3 shows the difference in winter survival of drilled and broadcast winter barley sown on adjoining plats early in September under the most favorable circumstances. The difference in favor of drilling was much more marked on later seedings.

CULTIVATION.

In general, winter barley is not cultivated. Experiments have been conducted in the use of the harrow or weeder while the plants were small, in order to destroy weeds as well as to conserve the moisture. In some instances beneficial results were obtained, but the increased yields were generally not sufficient to repay the additional expense.

Where the crop has suffered from the heaving and thawing of winter or early spring, excellent results follow the judicious use of a light roller in order to bring the exposed plants into closer contact with the soil. The roller should not be used while the soil is wet, as the trampling and compacting of the soil are likely to be injurious.



FIG. 3.—Plats of winter barley at the Arlington Experimental Farm, Virginia, showing severe winterkilling of the broadcast plat (at the right) in contrast to the drilled plat at the left. Sown September 1, 1910. Photographed April, 1911.

HARVESTING THE CROP.

CUTTING.

The proper time to cut winter barley is when most of the plants are yellow-ripe and the kernels can just be dented with the thumb-nail. If allowed to stand beyond this stage, the loss by shattering will be greater than any further increase in the yield of the crop through an increase in weight. The method of harvesting and caring for the crop is similar to that for wheat. So far as possible, discoloration of the grain should be prevented, as color is one of the prime factors in determining the market value.

SHOCKING AND STACKING.

In general, winter barley is shocked but not stacked prior to thrashing. As the crop is harvested at a time when summer rains are frequent, the shocks should be carefully capped to prevent discoloration and the sprouting of the grain. If the cap sheaves are then thrashed separately, the grain from the remaining bundles will be brighter and more uniform in color. Many growers in the West prefer to stack barley, as by so doing they obtain a better quality of grain. In order to build a good stack which will turn water successfully, it is necessary that the bundles be well lapped and the center of the stack kept higher than the outer edge.

THRASHING.

Winter barley should be thrashed as soon as it is cured, whether in the shock or the stack. If exposed to the weather for any length of time, it becomes badly discolored. While this injures it but little for feeding purposes, it materially depreciates its market value.

In operating the thrashing machine it is essential that the speed of the cylinder and the position of the teeth in the concave be properly adjusted, so that as few kernels as possible be broken. Barley kernels differ from wheat by breaking crosswise, so that the germ end is generally not seriously injured, though the broken grains are detrimental to the appearance and market value of the barley.

STORING THE GRAIN.

Winter barley differs from spring barley in that the crop is harvested and sown again within a few months' time. Therefore, shorter storage is required and the danger from insect injury lessened. It is essential, however, that the seed be dry before storing and that the bins be dry and well ventilated, as the germination may be seriously injured by heating, even though the grain is stored for only a few months.

USES OF WINTER BARLEY.

Winter barley has a wide range of usefulness, both as a grain and as a forage crop. As a grain crop the market demand exceeds the supply. When good, clean grain is produced in sufficient quantity it will be used by the maltsters and the demand will thus be increased. At present winter barley is principally used for feeding purposes and as a nurse crop or a cover crop.

GRAIN FOR STOCK FEED.

So far as chemical analyses show, with the exception of a lower percentage of fat, barley is equal in feeding value to corn. Numerous

experiments have demonstrated that barley can be fed successfully to horses, cattle, sheep, hogs, and poultry. When ground and soaked it is a highly nutritious food for hogs and should be more generally used for pork production. When fed in connection with skim milk, it is one of the best bacon-producing feeds known. For feeding to horses and cattle the best results are obtained if the barley is ground or soaked overnight, as the animals can then digest and assimilate it more readily. It is an excellent feed for poultry, especially in the winter, as it stimulates egg production.

PASTURE.

Winter barley, while not generally recommended for grazing, is of considerable value for that purpose. If judiciously handled, so that too much trampling is avoided, it furnishes excellent pasture for stock. Barley pasture is particularly good for hogs. If a specially heavy growth is made, light grazing in the fall may prove beneficial by causing it to stool more heavily. Pasturing too closely or when the soil is wet reduces the yield of grain. In some localities a mixture of wheat and barley furnishes better grazing than either alone.

SOILING CROP.

For feeding green to stock, winter barley can be grown alone or sown with wheat, oats, or vetch. If cut in the milk stage, before the beards become tough, it is excellent for soiling purposes. Sown with hairy or winter vetch and cut when the vetch pods are forming, a large quantity of excellent feed is produced, which can be used for soiling at a time when green feed is scarce. The crop is ready for feeding late in May or early in June.

HAY CROP.

Winter barley for hay should be cut either when flowering or when the grain is in the milk stage. At this time the beards are soft and not likely to be injurious to stock. The stems and leaves are still green and succulent and contain practically all the nutritive elements which are later transferred to the grain. The crop is cut and cured similarly to oat hay.

NURSE CROP.

Winter barley generally gives better satisfaction as a nurse crop than either wheat or oats. It does not grow so tall as either of the other grains, nor does it make so dense a shade as oats. In addition, it is removed from the land several weeks earlier in the season. The removal of the crop before hot weather allows the young grass to

receive the benefit of the moisture remaining in the soil. Frequently this means the success or failure of the crop following, especially if the season is long and dry. An excellent example of the use of winter barley as a nurse crop for red clover is shown in figure 4.

COVER CROP.

As a cover crop winter barley is valuable in preventing the washing so prevalent wherever heavy clay soils are unprotected. Where a cover crop is used there is also a considerable reduction in the



FIG. 4.—A field showing winter barley as a nurse crop for red clover at the Tennessee Agricultural Experiment Station, Knoxville. Photographed May 28, 1909.

leaching of valuable salts and fertilizing elements by the winter rains. This crop has also been used as a cover crop for orchards in the North. The plants are usually killed by the winter, but they afford considerable protection to the soil.

IMPROVEMENT OF THE CROP.

The improvement of barley can be effected by sowing only the best seed, removing all small, light, and shriveled grains by a thorough cleaning and grading. As this process does not eliminate all the poor

and weak seeds, the improvement is not usually permanent, however, unless the grading is repeated each year. Better results will be obtained if the best heads are selected from the field at harvest time and the seed from these heads sown in a small plat by itself. Care should be taken to select the heads from plants that grew under ordinary conditions, and not from those which were particularly favored by being near the edge of the field, in places where the stand was thin, or on very rich ground. The heads which are selected should be as uniform in type as possible. If sufficient heads are selected to make half a bushel or a bushel of seed and this selected grain is sown rather thinly on good land, enough seed will be produced from it in a year or two to sow a considerable area. This seed should be harvested and thrashed separately from the main crop and should be sown by itself, so that the selected seed may be increased.

A more certain way to improve winter barley is to select the very best individual heads and grow the seed from each separately in a short row. The next season, when the crop is mature, the best rows should be selected and harvested separately. The seed from the several rows which are selected should then be sown in increase rows or plats, sowing each at the same rate. If the rows are 1 foot apart, seeding at the rate of $2\frac{1}{2}$ ounces to each 100 feet of row is practically equivalent to $1\frac{1}{2}$ bushels to the acre. The one or two pure strains which prove to be best after a comparative test, such as this, should be increased as rapidly as possible, in order to obtain sufficient seed for field planting. In this way pedigree seed may be obtained and the yield and quality of the crop permanently improved.

